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DISCUSSION OF THE ARTICLE "ON THE DEVELOPMENT OF AUTOMATICS AND TELEMECHANICS IN THE FIFTH FIVE-YEAR PLAN"

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The letter written by a group of scientists of the Leningrad Electrotechnical Institute -- "On the Development of Automatics and Telemechanics in the Fifth Five-Year Plan" -- published in Avtomatika and telemekhanika, No 2, 1953, as well as the communications by other participants of the resulting discussion, touch on many important problems.

All the participants in the discussion indicate correctly that for further successful development of automatics and telemechanics it is essential that first of all the 3 most important problems be solved:

1. Establish regular production in sufficient quantity of standard automatic and telemechanical apparatus for industry, agriculture, and scientific-research and educational institutions.

2. Expand and extend the preparation of specialists in design, construction, production, and operation of automatic and telemechanical devices.

3. Reinforce the connection between the individual scientific institutions and other organizations that engage in the problems of automation and telemechanics.

In fact, the majority of automatic devices that operate in various branches of industry have many common elements (different types of relays, transmitters, amplifiers, sources of supply, etc). At the present time these standard units are manufactured at the enterprises of various ministries in limited quantities, frequently using handicraft or semi-handicraft methods. The laboratories of the higher teaching institutes are very poorly equipped with the latest automatized equipment.

It would undoubtedly be advantageous to concentrate the production of standard units in specializing plants. This would facilitate considerably the production of automatic devices, would improve quality, and at the same time contribute to a wider development of the automatization of the national economy. Since such typical standard units are mostly electrotechnical devices, their production would best be concentrated in the enterprises of the Ministry of Electrotechnical Industry.

At the same time one must not go to the other extreme, as was done by those who initiated the discussion (professor N. K. Begoreditskiy, professor C. V. Vasil'yev, et al.) who proposed the creation of a "single administrative-economic center to administer the introduction of automatics

and the production of corresponding apparatus" and the establishment of special automatics and telemechanics faculties.

Adapting these proposals would convert the problem of automatization and telemechanization into an end in itself, a sort of "art for art's sake." Yet, as was correctly noted by another group of scientists of the Leningrad Electrotechnical Institute (professor S. A. Zinkevich, professor V. I. Ivanov, et al), "automatics and telemechanics are merely one of the means for further raising the productivity of machines and tools and facilitating human labor, and being such, they are an organic part of the electrification or mechanization of individual machine tools, production installations, or processes." Automatization is very closely linked to the technology of manufacture.

This is why every branch of the national economy will employ specific apparatus of its own, in addition to standard automatic apparatus. The development of such equipment cannot be centralized. The task of developing specialized apparatus by widely utilizing standard units should be imposed on the scientific-research institute of the various branches of industry.

Nor is it advantageous, in our opinion, to adopt the suggestion concerning the need of training specialists for automatization and telemechanics in special faculties. One must not forget that before any machine or production aggregate or process can be automatized at all it is necessary to study deeply and thoroughly the entire technological process and its specific features. It is therefore impossible to train universal "automatizers," capable of automatizing any manufacturing process. The conclusion that it is not efficient to train specialized "automatizers," was reached, for example, by the all-union conference on the automatization of technological process and machine building, held in the fall of 1953 in Moscow. The resolutions of this conference state: "The conference notes that the prevalent opinion that it is essential to train narrowly-specialized specialists in automation is in error."

In the present state of development of the technology of machine building, automatization is a basic method and means for increasing labor productivity. Therefore, every scientific and engineering-technical worker who works in the field of machine building must have a certain knowledge of the theory and methods of the automatization of technological processes in machine building."

This is why we consider a more correct point of view concerning the problem of training cadres the one held by the second group of scientists of the Leningrad Electrotechnical Institute (professor S. A. Zinkevich, professor V. I. Ivanov, etc), who think that the training of specialists should be carried out in 2 directions: (a) training of specialists in the design, construction, and preparation of automatic apparatus, instruments, and devices; (b) training of specialists for a definite branch of the national economy, equipped with a knowledge of modern means of automatization.

However, we do not share their opinion concerning the need of excluding from the speciality "electrification of commercial enterprises" the specialization "automatization of electrotechnico installations in comercial enterprises," together with the basic course on the "automatization of manufacturing processes," for all electromechanical, power, and polytechnic higher schools. Introducing individual courses on "electric equipment for production mechanisms" and

"automatization of manufacturing processes" for different specialities produces an artificial barrier between the electric equipment for production mechanisms and the automatized electric equipment.

The course on "automatization of manufacturing processes" is too all-inclusive and vague, and its name cannot correspond to its scope.

The only course that in practice can be given to student-electricians is that on "automatization of electrical installations in industrial enterprises," the contents of which would not differ essentially from the general course on "electric equipment for production mechanisms," for the majority of modern electric apparatus is automatized. In our opinion it is necessary not to follow the path of providing individual specialization for "automatizers," but rather the path of better preparing the students in their basic speciality "electrification of commerical enterprises" in the field of the theory and means of automatization. The task of higher schools is also to teach young specialists how to apply and correctly employ these means in modern automatized electric drives and other electrotechnical installations of industrial enterprises. Specialists of this type should not be "automatizers" in general, but engineers-electricians, capable of effecting, jointly with the specialist-technologist of the corresponding branches, the complex automatization of manufacturing processes. A serious obstacle that makes training of cadres difficult is the lack of textbooks and handbooks on the theory of regulation and on the design of automatic devices. It is essential that within the next few years textbooks be published at least for such important courses as "theory of automatic regulation," "control of electric drives," and "principles of telemechanics.

Inasmuch as the role of automatization becomes more important at all times nowadays, the introduction of a course on "principles of automatization" for all specialities becomes desirable. However, a detailed study of the problems of telemechanics on the part of all specialties, as suggested by N. K. Bogoroditskiy, D. V. Vasil'yev, et al., by introducing a course on "principles of automatics and telemechanics" is superfluous. Telemechanical means are not employed everywhere; rather only in cases in which distances between the controlled object and the command points are great. Therefore, the application of telemechanics is still limited only to certain definite fields. There are many branches of industry having a very high degree of mechanization, but requiring no telemechanical control principles at all, i.e., automatization is not necessarily always linked with telemechanization.

It must be noted that in the teaching plans of the Ministry of Higher Education with respect to teaching telemechanics there are many great shortcomings. Thus, for example, students in many higher schools who specialize in "electric stations, networks, and systems" are taught the problems of telemechanics on a very limited scale in a general course on "relay protection and automatization of power systems." Yet telemechanics in power systems is so widely used at the present time that its study should be covered in a separate course for students in this specialty. At the same time more than 100 hours are devoted to the study of telemechanics in the specialization "automatization of electrotechnical installations of commerical enterprises." Engineers of this type should as a rule work within a single enterprise. In their practical work they will encounter much more rarely the need for control and regulation at such long distances at which the ordinary means of remote control and regulation become insufficient and it becomes necessary to employ telemechanical principles. It is therefore

necessary to reduce considerably the number of hours devoted to the study of telemechanics for these specialities.

As concerns the problem of reinforcing the connection between the individual scientific institutions and other organizations engaged in problems of automatization and telemechanics, a great role should be played here by the periodical press and in particular by the journal called Avtomatika i Telemekhanika. The pages of this periodical should be more frequently devoted to descriptions of actual examples of automatization.

For the sake of exchange in experience it is necessary to organize permanent exhibitions of the latest accomplishments in the field of automatization at the branch scientific research institutes. It is also necessary to hold more frequently topical conferences on individual problems of automatization.

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